

(54) **METHOD FOR NODE RANKING IN A LINKED DATABASE**

(75) Inventor: **Lawrence Page**, Stanford, CA (US)

(73) Assignee: **The Board of Trustees of the Leland Stanford Junior University**, Stanford, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/004,827**

(22) Filed: **Jan. 9, 1998**

**Related U.S. Application Data**

(60) Provisional application No. 60/035,205, filed on Jan. 10, 1997.

(51) **Int. Cl.**<sup>7</sup> ..... **G06F 17/30**

(52) **U.S. Cl.** ..... **707/5; 707/7; 707/501**

(58) **Field of Search** ..... **707/100, 5, 7, 707/513, 1-3, 10, 104, 501; 345/440; 382/226, 229, 230, 231**

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

4,953,106	*	8/1990	Gansner et al.	345/440
5,450,535	*	9/1995	North	395/140
5,748,954		5/1998	Mauldin	395/610
5,752,241	*	5/1998	Cohen	707/3
5,832,494	*	11/1998	Egger et al.	707/102
5,848,407	*	12/1998	Ishikawa et al.	707/2
6,014,678	*	1/2000	Inoue et al.	707/501

**OTHER PUBLICATIONS**

S. Jeromy Carriere et al, "Web Query: Searching and Visualizing the Web through Connectivity", Computer Networks and ISDN Systems 29 (1997). pp. 1257-1267.\*

Wang et al "Prefetching in Worl Wide Web", IEEE 1996, pp. 28-32.\*

Ramer et al "Similarity, Probability and Database Organisation: Extended Abstract", 1996, pp. 272.276.\*

Craig Boyle "To link or not to link: An empirical comparison of Hypertext linking strategies". ACM 1992, pp. 221-231.\*

L. Katz, "A new status index derived from sociometric analysis," 1953, Psychometricka, vol. 18, pp. 39-43.

C.H. Hubbell, "An input-output approach to clique identification sociometry," 1965, pp. 377-399.

Mizruchi et al., "Techniques for disaggregating centrality scores in social networks," 1996, Sociological Methodology, pp. 26-48.

E. Garfield, "Citation analysis as a tool in journal evaluation," 1972, Science, vol. 178, pp. 471-479.

Pinski et al., "Citation influence for journal aggregates of scientific publications: Theory, with application to the literature of physics," 1976, Inf. Proc. And Management, vol. 12, pp. 297-312.

N. Geller, "On the citation influence methodology of Pinski and Narin," 1978, Inf. Proc. And Management, vol. 14, pp. 93-95.

P. Doreian, "Measuring the relative standing of disciplinary journals," 1988, Inf. Proc. And Management, vol. 24, pp. 45-56.

(List continued on next page.)

*Primary Examiner*—Thomas Black

*Assistant Examiner*—Uyen Le

(74) *Attorney, Agent, or Firm*—Harrity & Snyder L.L.P.

(57) **ABSTRACT**

A method assigns importance ranks to nodes in a linked database, such as any database of documents containing citations, the world wide web or any other hypermedia database. The rank assigned to a document is calculated from the ranks of documents citing it. In addition, the rank of a document is calculated from a constant representing the probability that a browser through the database will randomly jump to the document. The method is particularly useful in enhancing the performance of search engine results for hypermedia databases, such as the world wide web, whose documents have a large variation in quality.

**29 Claims, 3 Drawing Sheets**

